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INFECTIOUS ABORTION AND STERILITY.

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Harrisburg, Penna.,
November 1, 1921.

Hon. Fred Rasmussen,
Secretary of Agriculture,
Harrisburg, Pennsylvania.

Dear Mr. Secretary:

We have been greatly in need of practical information pertaining to abortion and sterility, arranged in such a form that it could be distributed and would be readily understood. In August 1921 we appointed a committee to prepare material for a bulletin covering these subjects.

The committee, after having thoroughly studied the subjects rendered a report November 1, 1921, which we believe contains the kind of information needed.

We recognize the necessity of getting the information out at as early a date as possible and we recommend that this material be published as a Department Bulletin for distribution.

Yours respectfully,

T. E. MUNCE,
State Veterinarian.

Harrisburg, Penna.,
November 1, 1921.

Dr. T. E. Munce,
State Veterinarian,
Harrisburg, Penna.

Dear Doctor Munce:—

The undersigned committee have in compliance with your request, prepared some statements and recommendations pertaining to infectious abortion and sterility. The aim has been to set forth some facts about this disease, particularly of cattle, and arrange them in a manner that would be easily understood.

The Committee has therefore, endeavored to present its report in a form that would be inductive to simplicity, and not with the hope that it would appear as a scientific article.

It may be inferred by some that several of the recommendations are impracticable of application. In some cases it would seem that way, but in other instances the principles can be quite easily practiced. The Committee believes in all the recommendations but if only some breeders will apply them in all details, and others will apply them as far as conditions permit, then the purpose of the recommendations will have been accomplished.

Respectfully submitted,

H. R. Church, Chairman
W. H. Ridge
F. A. Marchall
M. F. Barnes

ABORTION IN ANIMALS.

Infectious Abortion occurs in all species of domestic animals, and with the exception of cattle and swine is caused in each by a different bacteria. In cattle and swine it is caused by the same bacteria. Infectious abortion in mares, although not widespread, has been studied on different occasions by the Bureau of Animal Industry, Pennsylvania Department of Agriculture. The form known in ewes has not been reported in Pennsylvania. It is however, important to know that such forms of infectious abortion exist so that barriers may be constructed against them.

To define exactly what is meant by the term abortion is practically impossible. It has been defined as the expulsion of a fetus before it is fully enough developed to be viable. After the fetus is viable the condition has been termed premature birth. It seems however, that we should from the standpoint of infection, regard as an abortion, any premature delivery of a fetus whether dead or alive, viable or unviable. Animals may be infected and at the same time may give birth to their young at the time they would be normally due. The term abortion is a misnomer and does not indicate which animals are dangerous spreaders, and in its narrow sense, means only the arrest of development. In this article we shall use it in a broader sense to mean all animals affected with its causative bacteria.

There are however, other abortions that cannot be attributed to infective bacteria but the infectious forms are by far the most common and all abortions until proved otherwise should be considered infectious.

BOVINE INFECTIOUS ABORTION.

The loss from infectious abortion of cows is said to be as great if not greater than those encountered from tuberculosis and in Pennsylvania alone it is estimated, exceed one million dollars annually.

There have been several bacteria and conditions reported as a possible cause of abortion in cows, but there is only one cause known to be responsible for the widespread losses to the cattle raising industry from abortion. This cause was discovered by Prof. Bang of Denmark in 1896 and is called Bang's Bacterium. Since that time it has been found on numerous occasions to be the cause of abortion in cattle. The form of abortion caused by *B. Abortus Bang* has been termed, "Bovine Infectious Abortion," and when the term "Bovine Infectious Abortion" is used, it is understood to represent the disease caused by *B. Abortus Bang* or by the germ discovered by Prof. Bang in conjunction with abortion in cattle.

It is generally believed that the bacteria is taken into the digestive tract through the mouth of the mother, and reaching the uterus

by the circulation, attacks the membranes which surround the fetus and by working on these membranes destroys some of the connections of the young and the mother, and interfering with the nourishment of the fetus, causes irritation and contraction of the uterus and as a consequence the calf is born before it is fully developed, either dead or alive, depending whether the nourishment had been sufficiently interfered with or not.

Bovine infectious abortion is usually first made manifest by the appearance of an abortion, although the act of aborting is not its only characteristic. If cows are carefully observed each day in herds where abortions are occurring it may be noticed that most of them show signs of abortion a few days before it occurs. The symptoms are often overlooked. The signs or symptoms may be a slight swelling and reddening of the lips of the vulva, with slight discharge of mucus and enlargement of the udder, and in milking cows, probably a slight increase in the amount of milk. There may also be slight relaxation of the ligaments at the base of the tail and a general uneasiness. There may be seen in a less marked degree, the same line of symptoms as can be observed when a cow is due to calf at full term.

The losses encountered by bovine infectious abortion are recognized to an appreciable extent only by those who have experienced a scourge of it. Breeders of cattle should therefore be honest with themselves and with their fellow breeders. If an abortion occurs in their herd they should handle it as the most dangerous form, and take every possible precaution to prevent further loss until they have had time to definitely determine whether it was infectious or not. Too many first abortions are considered mechanical or accidental.

Abortion not only causes the loss of a calf, but further, it interferes with the amount of milk secretion in the dam, deranges her general physical condition and leaves her quite prone to become sterile, either temporarily or permanently. If only temporarily her time of conception is delayed. Abortion is a persistent disease. Cows are pregnant during all seasons of the year and infection is always present, thus, young pregnant animals are always exposed to infection. Cows may abort the second or even the third time or oftener and then may become apparently immune and remain so for four or five years or longer. However, at the end of four or five years the process in some cases may be repeated.

To establish an accurate diagnosis requires the expert study of those specializing in animal diseases. The history of the herd and the individual animal history are valuable aids in making the diagnosis, but in order to definitely establish a diagnosis requires that the germ be found by microscopic study, or that specific laboratory methods of study be used.

The most favorable seat for the growth and development of *Bacterium Bang* is in the fetal membranes of the pregnant uterus and in the developed udder. It also has been found in the genital tract of infected bulls and in the stomach and intestines of newly born and aborted calves from infected dams. These must be considered as sources of infection.

Infected cows are regarded as the most dangerous spreaders at the time of normal calving or at the time of an abortion. An infected

cow does not necessarily need to abort to become a spreader. Not all animals affected with tuberculosis die of tuberculosis, neither do all cows abort that are affected with B. Abortus Bang.

The Bacterium Bang has not been found in the uterus of cows for more than 58 days after an abortion and seldom has it been found later than thirty days. After this time there should be little danger of healthy bulls becoming mechanical carriers from serving infected cows which have been properly treated.

Infected bulls must be regarded as dangerous. The intestinal discharge from calves suckling infected mothers should be considered a source of infection. A large percentage of infected cows are lifetime carriers of abortion germs in the udder and their milk should be considered a source of infection.

It has been shown that abortion can be produced by feeding material containing the bacteria and it is believed that most of the infections are contracted through materials contaminated and eaten as food or taken into the mouth in some other way. One should guard against feeds and water becoming contaminated with material containing B. Abortus Bang.

There is no specific treatment known. The most can be accomplished by PREVENTION. For the prevention of abortion we offer the following recommendations:

1. Breed and raise your own animals.
2. Make improvements in bloodlines as much as possible by careful selection from within the herd rather than from outside sources, thus excluding outside infection.
3. Every cow in every herd should be handled as though she is infected.
4. There should be supplied on every farm a separate stall or stable known as a maternity barn, for cows at calving time. This stable should be so constructed that it can be easily disinfected, or better, fumigated with formaldehyde. On farms containing a large number of cows it should have sufficient number of completely separated stalls to accomodate the number of cows that would be calving at one time.
5. Every cow should be removed from the herd at calving time and placed in the maternity stable.
6. Every cow showing symptoms of abortion should be placed in the maternity stable.
7. Every cow placed in the maternity stable should be kept there until all discharge has ceased and the uterus has been properly treated and has been determined clean by examination.
8. All afterbirths and aborted or dead calves should be well buried or burned immediately.
9. The maternity stall should be cleaned and effectively disinfected immediately after calving and again before another cow goes into it. The manure and litter should not be placed in the exercise or feed yards.

10. Each pregnant cow, either in pasture or stable, should be seen by the herdsman every day. Any showing symptoms of abortion or nearing normal calving time should be removed to the maternity barn.
11. If purchases are to be made the history of the herd from which one wishes to purchase and the individual animal history should be determined and if either is doubtful the purchase should not be made until the animal's health is definitely determined, and even then, it is safer to purchase from healthy herds.
12. All newly purchased animals should be isolated for a period. All known tests for the determination of their health should be applied.
13. Bulls and unbred heifers are the safest animals to buy, but these should be isolated for a period, and should have passed the blood test for bovine infectious abortion before they are incorporated into the main herd.
14. Pregnant animals should not be purchased unless they are isolated until after they have given birth to a normal calf, have passed a satisfactory blood test within two weeks after having given birth to the normal calf, the uterus has been properly treated and has been determined clean by examination.
15. Any cows that have ever left the farm should be returned only under the same conditions as newly purchased animals.
16. Herd bulls should not be used for service to neighbors' cows.
17. In case an abortion has occurred in the stable the cow should immediately be isolated, the fetus and membranes buried, and the stable well cleaned and disinfected. An abortion occurring in the pasture field should be handled in the same way. The earth at the point should be covered with three or four inches of lime or a strong disinfectant.
18. Regard every case of abortion as infectious until otherwise determined.
19. Do not permit any person to inject a vaccine or serum to prevent abortion unless it has been generally recognized of value and has been approved by the state official charged with the prevention, control, and eradication of transmissible diseases of animals.
20. A living culture anti-bovine infectious abortion vaccine, administered in large dosage, is believed to be of some value in the immediate infected herd, but up to the present time its merits have not been sufficiently proved to recommend its use in other than very badly infected herds, and even then it is doubtful if its merits are sufficient to rank it higher than the above precautions properly executed. It has not been proved that it does not do damage. It should be used only under official supervision experimentally.
21. See that the herd is given good clean feed and water.
22. Do not allow calves to tramp over feed for the cows. Suckling calves from infected mothers are considered spreaders of infectious abortion.

23. Do not feed unsterilized milk from herds where abortion exists or from creameries, to cows or sows. Sows are susceptible to infection with *B. Abortus Bang*.

24. Manure piles should not be in the exercise or feed yards.

25. No cow should have access to manure piles at any time.

26. Members of bull clubs should exercise extreme precautions as pertains to abortion and other transmissible diseases. Bull clubs should be considered a unit and handled as one herd.

It is needless to mention that well constructed, clean, properly ventilated and well lighted stables; intelligent selection of breeding stock, proper food and good water, are essential to prevention.

Sunlight is known to be an effective disinfectant, therefore, stables so constructed as to receive the greatest amount of sunlight possible, are well constructed. However, we should not depend too much on sunlight as a means of disinfection. There are places in all stables that sun rays do not reach and it is necessary to use other methods of disinfection where disease bacteria exist. This cannot be practiced too frequently nor too thoroughly. We should always aim to use a good reliable and effective disinfectant.

EQUINE INFECTIOUS ABORTION.

Abortion in mares is caused by *Bacillus abortus equi* which is a different organism than the one causing abortion in cows and sows. It may occur on a farm at the same time however that cows and sows are aborting. It causes symptoms in mares similar to those caused by *Bacterium Abortus Bang* in cows. Infectious abortion in mares may also be caused by streptococci and other infections. It has been reported in conjunction with strangles. The *B. Abortus equi* is sometimes associated with joint ill of foals.

OVINE INFECTIOUS ABORTION.

Infectious abortion in ewes has been reported in this country on one or two occasions. It was studied by Carpenter in New York state and was found to be caused by a spirillum. It has never been reported in Pennsylvania.

SEQUELAE OF ABORTION.

The most important sequelae of abortion is probably the retention of the fetal membranes, spoken of as retained afterbirths. These membranes when retained are prone to decomposition and often form a medium through which other organisms can gain entrance to the uterus and cause the secondary infections which so often follow abortion. The Placenta becomes dead tissue and acts as an irritant thus favoring the development of secondary organisms. Other conditions such as metritis in its various forms, cystic ovaries, mastitis, scours and pneumonia in the new born have often been associated with abortion, but it is doubtful if these conditions have any direct relation. Indirectly they may be considered as sequelae of abortion. At the time of an abortion there is a deranged physical condition of the dam and a lowering of resistance. She can at this time harbor and propagate the organisms causative of these miscel-

laneous conditions. We do not believe that there is any direct relation between Bang abortion, white scours and calf pneumonias. The latter conditions occur in herds where there are no abortions and vice versa.

Abortion by lowering the resistance of the dam and by causing retention of the placenta, predisposes her to invasion with such pus producing organisms as streptococci, bacterium pyogenes, staphylococci and others. The resulting conditions are metritis in its various forms, cervicitis, salpingitis and ovaritis, which are causes of sterility. They probably account for more than 50% of the cases of abortion. *Sterility*

STERILITY.

Sterility or barrenness is a suspension of the generative functions and may be either temporary or permanent. The lesions found at autopsy are variable and of variable extent.

A great many of these abnormal conditions undoubtedly are caused more or less indirectly by B. Abortus Bang. After an abortion or a premature birth and sometimes after a normal parturition the fetal membranes are retained and the cervicle canal remains open. Due to the dilated condition of the cervix and the presence of the fetal membrane which are very prone to decomposition, numerous organisms can gain entrance to the uterus. The fetal membrane is dead tissue at this time and acts as a foreign body and it itself can cause irritation and inflammation of the uterine mucosa.

Our definition for inflammation is "The reaction of a tissue against the action of an irritant." The irritant under these conditions is usually in the form of pathogenic microorganisms. The organisms which have gained entrance can still continue the irritation after fetal membrane has disappeared or has been removed even after the cervical canal has closed, the latter usually becoming dilated again after the inflammation becomes severe. Organisms such as virulent streptococci, staphylococci and bac. pyogenes set up an aggressive inflammation of a purulent or suppurative type, and these or colon bacilli and micrococci are the organisms usually discovered in a bacteriological study of septic endometritis in cattle. The uterus and uterine mucosa are subject to probably the same forms of inflammation as other similar tissues, and range from a simple catarrhal to a suppurative or even chronic proliferative form: besides other specific inflammation such as tuberculosis which is quite frequent in herds where this disease has not been eliminated.

The uterine wall consists of three layers and so the inflammations are properly classified as to what portion is affected. The endometrium including the glandular layer as a part of it, is the most exposed and most subject to inflammatory conditions and when affected the condition known as an endometritis. Inflammation of the muscular layer is designated myometritis and of the perimetrium as perimetritis. Attempts to draw a line between these different forms clinically is practically impossible.

Endometritis may be catarrhal, suppurative, ulcerative, hemorrhagic or all combined and shows lesions similar to such inflamma-

tions of other similar tissues. The milder forms may end in recovery, others may become chronic. Most of the chronic forms are inclined to become catarrhal. In most all forms of uterine inflammation the walls become thickened and rather firm. In the interstitial form, however, the tissues may become atrophied due to pressure from the newly formed fibrous tissues which contracts later and the uterine wall becomes thinner than normal.

Cystic degenerations of the ovaries and diseases of the fallopian tubes are usually associated with uterine abnormal conditions. Some still contend that abnormal ovarian conditions are primary and abnormal uterine conditions secondary, but the general opinion is that the uterine conditions are primary. The ovaries do not seem to functionate properly when there is a foreign substance in the uterus, whether that be a mummified fetus or pus, or when there is an abnormal condition of the lining membrane of the uterus or cervix.

Under these conditions the corpus luteum often persists, that is, does not undergo normal retrogressive changes and atrophy, and simulates the corpus luteum of pregnancy.

It must also be taken into consideration that the bacteria present in the uterus and cervical canal, or their toxic products may have a direct action on the spermatozoa or indirectly by altering the secretions.

The most common abnormal conditions of the ovaries are cystic degeneration or retained corpus luteum or these changes may be present with an interstitial inflammatory condition.

The most common abnormal conditions of the fallopian tubes are hydrosalpinx and pyosalpinx and in tuberculus herds tuberculosis is an important factor, also acute or chronic catarrhal inflammatory conditions.

The cervix and cervical mucosa are subject to the various forms of inflammatory changes observed in the uterus proper. In nymphomaniacs there is usually a cervicitis in association with cystic degeneration of the ovaries. The cervix is often subjected to lacerations during parturition.

Various other abnormal conditions which are observed less frequently may be the cause of sterility, such as improper development or lack of development of the genital system or some portion of it. This cause is more likely to be observed in young animals which have failed to conceive.

Stenosis of any portion of the genital canal which may be brought about by abnormal conditions in surrounding tissues or organs or by swelling of the mucosa in the narrow portions of this canal, as in the cervix, the smaller portion of the cornua, or in the fallopian tubes, tumors within the genital canal or in the tissues surrounding it, are causes.

Other causes are misplacements or torsions and adhesions. The fimbriated extremity of the fallopian tube is sometimes so misplaced that it could not properly receive the ovum or it may be so inflamed or edematously swollen that if it did receive the ovum it could not conduct it into the proper channel for conception to take place.

Malnutrition, obesity, too rich protein diet and lack of exercise, animals crowded with fat forming diets in preparation for show ring, endocrine system unbalanced, insufficiency of the proper minerals, in breeding and withholding of breeding are other causes.

Granular vaginitis has been suggested by some as a probable cause. The bull should be considered. Attempts to remedy a temporary sterility by one who was not properly skilled or accidentally by one who was skilled has often been observed as a cause of a permanent sterility due to puncture of the endometrium followed by the development of abscesses in the uterine wall. The uterus under these abnormal conditions is lacking in tone and is usually very friable, thus its walls are very easily punctured.

The successful treatment of sterility requires the employment of those who have a knowledge of the generative organs, their diseases and are especially skilled in their diagnosis and treatment. Unskilled operators may do damage that will render animals permanently sterile and in some instances cause death. The operation when properly applied is almost devoid of damage.

It is essential that accurate records be kept by the herdsman of the estral periods, breeding dates, dates of calving, abortions, treatments and other things which pertain to the breeding functions. It is necessary at times for those treating the diseases of the genital system to refer to such records. Notations of abnormal conditions found should be made at the time of examinations and treatments.

The treatments prescribed should depend upon the abnormal conditions found which are variable. The uterus is generally involved when abnormal conditions exist in other parts. For the uterus, Albrechtsen uterine douche treatment has been found successful in a large percentage of cases. Many uterine troubles have been corrected by this method of treatment.

We have been applying the douche treatment for a period of five years in practically all sections of the state. During this time this treatment has given us plenty of opportunity to learn of its value. We have found it very beneficial. It has been a successful treatment in at least 75 per cent of the cases of apparent sterility of cattle.

Instruments Used.

- 1 20" uterine forceps
- 1 15" uterine forceps
- 1 $\frac{1}{4}$ " uterine catheter 12" long
- 1 $\frac{3}{8}$ " uterine catheter 12" long
- 1 $\frac{1}{2}$ " uterine catheter 12" long
- 1 $\frac{5}{8}$ " uterine catheter 20" long—rarely needed
- 1 curved medium dressing forceps
- 1 douche bag and tube
- 1 Rubber coat

The owner is expected to supply plenty of hot water, towels, soap, clean pails, and sufficient assistance.

The instruments should be sterilized before starting operation and they, as well as the operators hands and arms should be well disinfected before each cow is treated.

TECHNIC OF DOUCHING UTERUS.

If the cow has an abnormal discharge, or the history and examination reveal that she has aborted, the os. uterus should be presented for visual examination. Carry the 1st uterine forceps into the vagina, protected by the left hand and guided by the thumb and index finger. Fasten the jaw of the forceps to the right side of the os. Apply gentle traction and bring the os back so as to render it easier to attach the left forceps to the left side. Using gentle traction on both forceps the os may be drawn backward and into view between the lips of the vulva. If it presents a healthy pink color, free from granulations and congestion, and the mucous membrane is not puckered up in a ridge, it may be considered normal. If it has an inflammatory appearance, showing granulations and a thickened, edematous condition of the mucous membrane, infectious conditions are indicated. Infective organisms are most often found in the folds and clefts of the os, from which places they are hardest to dislodge.

Having prepared a 1½ per cent Lugol's solution in the douche bag at a temperature of about 115 to 118 degrees F. the small or medium catheter is carefully passed through the cervical canal in preparation for flushing the uterus. It is sometimes rather difficult to make this passage as the cervical canal does not run a straight course. Do not attempt to exert pressure. The catheter will slip through easily, if directed along the proper channel. Usually the course of the cervical canal is complicated. Placing one hand close to the os, using it as fulcrum and directing the end of the catheter across the lumen of the cervical canal, gives a sensation of roughness. This denotes the proper entrance. Make a slight effort to pass the catheter but do not force it. As soon as it passes freely, stop. Further insertion through the cavity of the uterus may cause the instrument to pierce the wall. In its relaxed condition this organ is very susceptible to injury and a little pressure may cause the catheter to puncture it in which case the douching fluid will be poured into the peritoneal cavity.

After the catheter has been successfully passed, open the tube of the douche bag and allow the cool portion of the solution in the tube to escape, until the warmer solution begins to flow. Then attach the tube to the catheter and elevate the douche bag about four feet above the level of the uterus, allowing the solution to flow into the uterus. The flow may be impeded or stopped by mucus collected in the catheter while passing through the cervix. This will necessitate clearing the catheter. Passing a syringe full of warm water through the catheter will clear out the mucus and the flow can be continued from the douche bag. Ordinarily from six to sixteen ounces of the solution will be required to distend the folds of the uterus and fill it to normal capacity without over-distention. In the case of pyometra, a larger quantity will be required. It is necessary that the solution fill the uterine horns as well as the body of the organ.

When the estimated quantity has passed, measures should be taken to determine the extent of distention. Remove the tube from the catheter. If the solution dribbles or escapes slowly, an additional quantity should be introduced. If it leaves the end of the catheter

in a solid stream jetting out about two inches before falling, and appearing as though under pressure, it indicates that the uterus has been properly distended.

Allow the catheter to remain in position for a few minutes for complete drainage. If the return flow diminishes as though being obstructed, insert the hand into the rectum a short distance. This will cause expulsive straining and tend to empty the uterus. If the uterus is found in a soft, flabby, relaxed state, it should be massaged through the rectum.

Careful observation should be made of the discharged douching solution to determine the presence of pus, necrotic tissue or other foreign matter.

The os uterus and cervical canal should be carefully examined and properly treated.

The operation having been completed, remove left forcep, push back the cervix and remove right. When removing the forceps, due care must be taken to loosen and release the teeth in the jaws of the forceps from their grip on the os, by rotating the instrument to prevent lacerations.

In cases of persistent discharging or inflammation it may be necessary to repeat the treatment at intervals of one to two weeks.

It is believed that many apparently sterile cows are not really sterile. They have conceived, carried the fetus a short time and expelled it unnoticed. Some of these cases are no doubt due to presence of pus-producing organisms in the uterus, setting up an endometritis, and are readily responsive to treatment. In treating unfruitful cows the operator should bear in mind the probability of a previous unobserved abortion.

Many veterinarians have become proficient in this line of work and many modifications of the above methods have been used. For example, the majority use only one pair of forceps or use two of the fifteen inch forceps instead of a twenty inch and a fifteen inch. Other solutions have been used by some for the douche with apparently as good results. The above however, are sufficient and safer for the beginner.

EFFECT OF UTERINE DOUCHE UPON MILK PRODUCTION.

The disclosure of the increased milk production was incidental to the use of the uterine douche treatment. Observations of the milk flow during the periods of treatment, were made to assist in determining whether or not the douche would react unfavorably in any manner, upon the cow. The milk flow, being a good indicator to the sensitivity of a cow to unusual conditions, was carefully noted and compared with the previous records of each individual. It was found that in cases which yielded to the treatment there was an immediate increase in the amount of milk.

THE BULL AND ABORTION.

The bull as a factor in the spread of abortion is not clearly understood. This subject will require considerable more study. If

the genital tract of cows are clean at the time of service, even though they have aborted, it does not seem that the bull could mechanically carry abortion from one to another. It seems that it would be much more necessary that the cow be clean at the time of service than that the bull be douched between services. To douche the sheath of the bull, however, may be more or less of a safeguard against his becoming infected with the pus producing organisms. If cows are susceptible to infection through inoculation per vagina, infected bulls could ~~not~~ act as the means of inoculation at the time of service. We are taught that if infection were to take place from inoculation by the bull at the time of service we could expect more early abortions. The general belief as pointed out above is that most of the infections take place through the digestive tract and in that case infected bulls could act as spreaders of infection which could be taken into the mouth of the cow in her food or otherwise. These questions should receive considerable experimental study.

THE BLOOD TEST FOR ABORTION IN CATTLE.

The blood test for Bovine infectious abortion is of the greatest value as a herd proposition for making a diagnosis of infection in the herd. The complement fixation and agglutination are the two tests usually employed. One is just about as valuable as the other. The agglutination test is the easiest of application and therefore probably the more practicable. A reaction to either or both of the blood tests does not indicate that an animal has or will abort. It is a specific test and indicates that the cow has been or was at the time of the test, infected with *Bacterium Abortus Bang*. It is of practical value in testing animals for addition to clean herds and for determining the extent of infection in a herd. For diseases in general an "Immune Reaction" is a reaction to a specific blood test when it is thought that the reacting animal is still carrying immune bodies from a previous infection with the disease under question although at the time of the test the organism causative of the disease is not in the animal's system. In abortion animals are often spoken of as showing an immune reaction when actually carrying infection in the udder or elsewhere but at the same time are apparently immune to the act of abortion.

RETAINED FETAL MEMBRANES.

The question of retained fetal membranes or placentae is a large one and is not always easily solved. In the division pertaining to sequelae of abortion retained membranes were given first place, but abortion is not the only predisposing cause. Fetal membranes are retained in many herds not infected with Bang's bacillus just as frequently as in herds that are infected specially if only the cows that do not actually abort are considered.

The question, "What is the cause of retained placenta," has often been asked. What should be done in case they are retained? Should they be removed or left alone? What treatment should be given? How is one going to know what to do?

To these questions no definite answer can be given. Exactly what causes the retention of the membranes in many instances is not

known although many theories have been advanced. The predisposing causes are variable. The probably most frequent causes are infection in the uterus with *Bacterium Bang* or some other micro-organism. It is not unlikely that the state of health and nutrition of the cow plays a great part. If she is in good physical condition and her eliminative organs are working properly in harmony, especially during the latter half of her gestation period and at parturition time, it seems that the number of retained membranes should be small. Many of the infections causative of retained placentae undoubtedly date back to the beginning of the gestation period. If the organs of reproduction were not healthy at the time conception took place one would naturally look forward in expectancy of retention of the placenta or some other abnormal condition at parturition time. Aside from infections which may exist, proper feed with neither underfeeding nor overfeeding and with sufficient mineral elements should prevent many retentions. The bowels should be in a good laxative condition at parturition time, and for a few days prior. It seems by the practice of this measure the number of retained placentae is reduced. Some breeders have apparently had good results from feeding an increased amount of linseed oil meal for a short period prior to parturition time.

In case the fetal placentae are retained, what should be done depends upon the nature of the individual case and in each case the question should be solved by a veterinarian who understands the nature of the genital tract. In some cases the fetal membranes can be removed as a whole with very little difficulty. In these cases it is not improper treatment to remove them. In other cases they can be removed with difficulty and in these cases if the operation does not require too much time and they can be completely removed it seems that the operation is advisable. In other cases they can not be removed without doing injury or without leaving parts of them, and this kind should be left alone and properly treated until such a time that their removal is advisable. The proper treatment and time for removal can usually be determined by the attending veterinarian. However, some cases do not respond readily to the usual forms of treatment. Aside from careful observance of the patient and attending to her eliminative organs, the best advice in case the placentae have been retained, is to call a veterinarian and leave the patient entirely in his hands to be cared for according to his proper advice.

It would be folly to recommend any special treatment for this condition, because one operator will have good results with a certain line of treatment which if placed in the hands of another would not give as good results.

The Pennsylvania Department of Agriculture, Bureau of Animal Industry, is making an extensive study of sterility of cows which includes a study of Bovine Infectious Abortion and is in a position to give timely advice on these subjects and are glad to work to the advantage of the breeder in conjunction with his veterinarian.

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JAMES W. KELLOGG, Chief Chemist

BUREAU OF CHEMISTRY



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DEPARTMENT OF AGRICULTURE
Bureau of Chemistry

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LINSEED OIL

PAINT

PUTTY

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AGRICULTURE LIME

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